Please replace the paragraph at page 3, lines 16 - 18, with the following paragraph (marked up version attached in Appendix):

a3

There is a continuing need to develop manufacturing processes which provide an abrasive disc having adequate strength to withstand relatively harsh grinding environments which can be easily manufactured and mounted to and unmounted from a tool.

Please replace the paragraph at page 5, lines 11-20, with the following paragraph (marked up version attached in Appendix):

a4

A perspective view of an exemplary abrasive disc according to the present invention is shown in FIG. 1. Abrasive disc 10 is shown mounted to tool (as shown, an angle grinder) 12. Abrasive disc 10 is threaded onto threaded shaft 14 of tool 12. Shaft 14 defines a longitudinal axis 15 extending through the center of abrasive disc 10. Abrasive disc 10 has an annular ring of abrasive material 20 (flap disc as shown) fixably mounted to generally circular backing plate 22. Although abrasive disc 10 is shown mounted to angle grinder 12, it would be understood that any tool having a rotational shaft could be used in conjunction with abrasive disc 10 (e.g., a drill). By "generally circular" it is meant that the abrasive disc is round in shape, and is typically circular, however other shapes (e.g., hexagonal) can be used without departing from the spirit and scope of the invention.

Please replace the paragraph at page 5, line 21 - page 6, line 4, with the following paragraph (marked up version attached in Appendix):

a5

FIG. 2 shows a plan view of abrasive disc 10 according to the present invention. Fastener 24 is mounted to backing plate 22 so as to allow threading of abrasive disc 10 to shaft 14 of tool 12. Backing plate 22 has grinding surface 22A and tool surface 22B (shown in FIG. 3). Fastener 24 can be, for example, a "threadless fastener" or sheet metal nut as is known in the art, as well as a Tinnerman nut fastening device, as described, for example, in U.S. Pat. No. 2,156,002 (Tinnerman), the disclosure of which is incorporated herein by reference. While the Tinnerman nut is the preferred fastening device, other types of fasteners may be used without departing from the spirit and scope of the invention. Preferred fastener 24 is a 1.5 inch (38.1 mm) quick-change button for mating with a 5/8 inch diameter by 11 thread per inch shaft (15.875 mm diameter by 0.43 threads

per mm), manufactured by Metal Products Engineering, Los Angeles, C&A. Fastener 24 can be formed, for example, from 28 gauge steel, although other materials (e.g., brass or aluminum) may be used without departing from the spirit and scope of the invention. Central aperture 26 (shown in dotted lines in FIG. 2) extends through the center of backing plate 22. Fastening apertures 29 are disposed coaxially about central aperture 26, are radially spaced about central aperture 26, and extend through fastener 24.

Please replace the paragraph at page 6, lines 20 - 29, with the following paragraph (marked up version attached in Appendix):

a6

Fastener 24 is fixed to backing plate 22 by tines 46 which are integral with annular flange 28. Tines 46 are bent through fastening apertures 29, extending from grinding side 22A of backing plate 22 to tool surface 22B of backing plate 22. That portion of each tine 46 which extends beyond tool surface 22B is then bent inwardly (or outwardly) so as to extend radially along tool surface 22B of backing plate 22. Thus, tines 46 engage backing plate 22 so that fastener 24 is fixed, both rotationally and axially, to backing plate 22. Fastening apertures 29 in backing plate 22 are typically formed when fastener 24 is mounted to backing plate 22, as discussed below. Thus, fastener 24 should be formed from a material which is hard enough to push tines 46 through backing plate 22 while being flexible enough so that tines 46 can be bent along tool surface 22B.

Please replace the paragraph at page 7, lines 22 - 31, with the following paragraph (marked up version attached in Appendix):

a7

The above described method is an exemplary method for fitting a fastener into the backing plate. It is understood that other methods are known in the art and may also be used without departing from the spirit and scope of the invention. For example, the fastener can be extended through the central aperture from the tool surface to the grinding surface. Additionally, for example, a Grit-Lock type fastener, as described for example, in U.S. Pat. No. 4,245,438, (van Buren, Jr.), the disclosure of which is incorporated herein by reference, can be mounted to the backing plate in substantially the same fashion as described above. Additionally, the order of assembly steps need

not occur exactly as described above (e.g., fastener 24 can be secured to backing plate 22 before affixing the abrasive material).

Please replace the paragraph at page 9, lines 14 - 24, with the following paragraph (marked up version attached in Appendix):

a8

Embodiments of the present invention utilize a backing plate that possesses a flexural modulus of at least about 9000 kg/cm^2 under ambient conditions, with a sample size of 25.4 mm (width) x 50.8 mm (span across the jig) x 0.8-1.0 mm (thickness), and a rate of displacement of 4.8 mm/min, as determined by following the procedure outlined in the American Society for Testing and Materials (ASTM) D790 (published 1991) test method, the disclosure of which is incorporated herein by reference. Some embodiments of the backing plate possess a flexural modulus of between about 9000 kg/cm^2 and about 141,000 kg/cm^2. Flexural moduli less than about 9000 kg/cm^2 are typically too low to provide the desired level of abrading performance. A backing plate with a flexural modulus greater than about 141,000 kg/cm^2 is generally too stiff to sufficiently conform to the surface of the workpiece.

Please replace the paragraph at page 11, lines 6 - 11, with the following paragraph (marked up version attached in Appendix):

a9

The backing plate contains a thermoplastic binder material (25 as shown in FIG. 3) and an effective amount of a fibrous reinforcing material (27 as shown in FIG. 3). By an "effective amount" of a fibrous reinforcing material, it is meant that the backing plate contains a sufficient amount of the fibrous reinforcing material to impart at least improvement in heat resistance, toughness, flexibility, stiffness, shape control, etc., discussed above.

Please replace the paragraph at page 12, lines 9 - 19, with the following paragraph (marked up version attached in Appendix):

a10

The backing plate can be formed, for example, by shaping or molding the thermoplastic material using conventional molding techniques such as injection molding. Use of such molding techniques can reduce the amount of materials wasted in construction, relative to conventional "web" processes. Injection molding can also allow for the backing plate to be more

concentric than what was previously available. Making the backing plate concentric aids in minimizing or eliminating wobbling during use of the abrasive disc. Additionally, for example, a concentric backing plate may allow tighter manufacturing tolerances to be kept (i.e., when mounting the abrasive material and the fastener). Additionally, for example, higher concentricity of the abrasive disc can minimize or prevent curling of the edges which can occur during grinding, thereby increasing the efficiency of the abrasive disc.

Please replace the paragraph at page 13, lines 1 - 5, with the following paragraph (marked up version attached in Appendix):

a1

Moldable thermoplastic materials utilized in the present invention include those having a high melting temperature, good heat resistance properties, and good toughness properties such that the hardened backing plate composition containing these materials operably withstands abrading conditions and mechanical insertion of the fastener without substantially deforming or disintegrating.

Please replace the paragraph at page 13, lines 6 - 15, with the following paragraph (marked up version attached in Appendix):

a2

Hardened backing plate compositions include those that can withstand a temperature of at least about 200°C and a pressure of at least about 7 kg/cm^2, preferably at least about 13.4 kg/cm^2, at the abrading interface of a workpiece. Moldable thermoplastic materials include those having a melting point of at least about 200°C, preferably at least about 220°C. Additionally, the melting temperature of the tough, heat resistant, thermoplastic material is preferably sufficiently lower (i.e., at least about 25°C lower) than the melting temperature of the fibrous reinforcing material. In this way, the fibrous reinforcing material is not adversely affected during the molding of the binder. Suitable thermoplastic materials also include those that are generally insoluble in an aqueous environment, at least because of the desire to use the abrasive disc on wet surfaces.

A

Please replace the paragraph at page 13, lines 23 - 29, with the following paragraph (marked up version attached in Appendix):

a13

A preferred thermoplastic material from which the backing plate is formed is a polyamide resin material, which is characterized by having an amide group, i.e., --C(O)NH--. Various types of polyamide resin materials (i.e., nylons) can be used, such as nylon 6/6 or nylon 6. Nylon 6/6 is a condensation product of adipic acid and hexamethylenediamine. Nylon 6/6 has a melting point of about 264°C and a tensile strength of about 770 kg/cm^2. Nylon 6 is a polymer of ε-caprolactam. Nylon 6 has a melting point of about 223°C and a tensile strength of about 700 kg/cm^2.

Please replace the paragraph at page 14, lines 16 - 23, with the following paragraph (marked up version attached in Appendix):

a14

The fibrous reinforcing material can be in the form of individual fibers or fibrous strands, or in the form of a fiber mat or web. The fibrous reinforcing material can be, for example, in the form of individual fibers or fibrous strands for advantageous manufacture. Fibers are typically defined as fine thread-like pieces with an aspect ratio of at least about 100:1. The aspect ratio of a fiber is the ratio of the longer dimension of the fiber to the shorter dimension. The mat or web can be either in a woven or nonwoven matrix form. A nonwoven mat is a matrix of a random distribution of fibers made by bonding or entangling fibers by mechanical, thermal, or chemical means.

Please replace the paragraph at page 15, lines 6 - 9, with the following paragraph (marked up version attached in Appendix):

a15

Generally, any ceramic fiber is useful in applications of the present invention. Examples of ceramic fibers suitable for the present invention include those marketed under trademark designations "NEXTEL 312, 440, 610, 650 and 720" by the 3M Company, St. Paul, MN.

A

Please replace the paragraph at page 16, lines 5 - 15, with the following paragraph (marked up version attached in Appendix):

a16

The fibrous reinforcing material can be distributed throughout the thermoplastic material (i.e., throughout the body of the backing plate, rather than merely embedded in the surface of the thermoplastic material). This is for the purpose of imparting improved strength and wear characteristics throughout the body of the backing plate. A construction wherein the fibrous reinforcing material is distributed throughout the thermoplastic binder material of the backing plate body can be made using either individual fibers or strands, or a fibrous mat or web structure of dimensions substantially equivalent to the dimensions of the finished backing plate. Although in this preferred embodiment distinct regions of the backing plate may not have fibrous reinforcing material therein, it is preferred that the fibrous reinforcing material be distributed substantially uniformly throughout the backing plate.

Please replace the paragraph at page 16, line 28 - page 17, line 2, with the following paragraph (marked up version attached in Appendix):

a17

Embodiments of the present invention can utilize a backing plate comprising between about 1% and about 30% of the toughening agent, based upon the total weight of the backing plate. Preferably, the toughening agent (i.e., toughener) is present in an amount of about 5-15 wt-%. The amount of toughener present in a backing plate may vary depending upon the particular toughener employed. For example, the fewer elastomeric characteristics a toughening agent possesses, the larger the quantity of toughening agent may be required to impart desirable properties to the backing plates.

Please replace the paragraph at page 17, lines 22 - 31, with the following paragraph (marked up version attached in Appendix):

a18

If the backing plate is made by injection molding, typically the toughener is added as a dry blend of toughener pellets with the other components. The process usually involves tumble-blending pellets of toughener with pellets of fiber-containing thermoplastic material. A more preferred method involves compounding the thermoplastic material, reinforcing fibers, and

A

toughener together in a suitable extruder, pelletizing this blend, then feeding these prepared pellets into the injection molding machine. Commercial compositions of toughener and thermoplastic material are available, for example, under the designation "ULTRAMID" from BASF Corp., Parsippany, NJ. Specifically, "ULTRAMID B3ZG6" is a nylon resin containing a toughening agent and glass fibers that is useful in the present invention.

Please replace the paragraph at page 19, lines 4 - 9, with the following paragraph (marked up version attached in Appendix):

a19

Utilizing the binder in combination with the fibrous reinforcing material provides strength and flexibility to the backing plate material which allows it to be thinner and lighter than backing plates used in previous abrasive discs (e.g., thermoplastic impregnated cloth). The mechanical properties of the backing plate in the inventive abrasive disc allow the fastener to be press fitted into the backing plate without cracking the backing plate while the backing plate remains strong enough to withstand the harsh grinding environment.

Please replace the paragraph at page 20, lines 10-17, with the following paragraph (marked up version attached in Appendix):

a20

Another example of an exemplary abrasive disc according to the present invention is shown in FIG. 4. Abrasive disc, 110 includes abrasive material 122, fastener 124, and adhesive 138 (including inner bead 140 of adhesive 138) as described with respect to FIGS. 1-3. Abrasive article 120 in FIG. 4 is illustrated as a nonwoven abrasive. Nonwoven abrasive products (illustrated, for example, in FIG. 4) typically include an open porous lofty polymer filament structure having abrasive grains distributed throughout the structure and adherently bonded therein by an organic binder. Examples of filaments include polyester fibers, polyamide fibers, and polyaramid fibers.

Please replace the paragraph at page 20, line 28 - page 21, line 10, with the following paragraph (marked up version attached in Appendix):

a21

Suitable organic binders for making abrasive layers include thermosetting organic polymers. Examples of suitable thermosetting organic polymers include phenolic resins, urea-formaldehyde resins, melamine-formaldehyde resins, urethane resins, acrylate resins, polyester

resins, aminoplast resins having pendant α,β-unsaturated carbonyl groups, epoxy resins, acrylated urethane, acrylated epoxies, and combinations thereof. The binder and/or abrasive product may also include additives such as fibers, lubricants, wetting agents, thixotropic materials, surfactants, pigments, dyes, antistatic agents (e.g., carbon black, vanadium oxide, graphite, etc.), coupling agents (e.g., silanes, titantates, zircoaluminates, etc.), plasticizers, suspending agents, and the like. The amounts of these optional additives are selected to provide the desired properties. The coupling agents can improve adhesion to the abrasive particles and/or filler. The binder chemistry may be thermally cured, radiation cured or combinations thereof. Additional details on binder chemistry may be found, for example, in U.S. Pat. Nos. 4,588,419 (Caul et al.), 4,751,137 (Tumey et al.), and 5,436,063 (Follett et al.), the disclosures of which are incorporated herein by reference.

Please replace the paragraph at page 21, lines 11 - 24, with the following paragraph (marked up version attached in Appendix):

Typically, the abrasive particles have a moh's hardness of at least 5, 6, 7, 8, 9, or even 10. Suitable abrasive grains include fused aluminum oxide (including white fused alumina, heat-treated aluminum oxide and brown aluminum oxide), silicon carbide, boron carbide, titanium carbide, diamond, cubic boron nitride, garnet, fused alumina-zirconia, and sol-gel-derived abrasive particles, and the like. The sol-gel-derived abrasive particles may be seeded or non-seeded. Likewise, the sol-gel-derived abrasive particles may be randomly shaped or have a shape associated with them, such as a rod or a triangle. Examples of sol gel abrasive particles include those described in U.S. Pat. Nos. 4,314,827 (Leitheiser et al.), 4,518,397 (Leitheiser et al.), 4,623,364 (Cottringer et al.), 4,744,802 (Schwabel), 4,770,671 (Monroe et al.), 4,881,951 (Wood et al.), 5,011,508 (Wald et al.), 5,090,968 (Pellow), 5,139,978 (Wood), 5,201,916 (Berg et al.), 5,227,104 (Bauer), 5,366,523 (Rowenhorst et al.), 5,429,647 (Larmie), 5,498,269 (Larmie), and 5,551,963 (Larmie), the disclosures of which are incorporated herein by reference. The abrasive grains may also be present in the form of abrasive agglomerates.

a2